

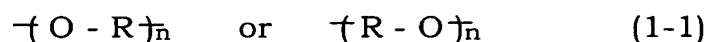
# CLAIMS

1. An ionic liquid type functional material comprising an aromatic compound which has a fluorine-containing ether chain and is  
5 represented by the formula (1):



wherein -D- is a fluoroether unit represented by the formula (1-1):

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in which R is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of  
15 hydrogen atoms is replaced by fluorine atom; n is an integer of from 1 to 20, and when m is not less than 2, two or more of D may be the same or different;

Ra is a monovalent organic group which has 1 to 20 carbon atoms and does not contain said D, and when m is not less than 2, two or more of  
20 Ra may be the same or different;

m is an integer of from 1 to 4;

Ry is a mono-, di-, tri- or tetra-valent organic group having 2 to 30 carbon atoms which has at least one selected from basic functional groups Y<sup>1</sup> and/or salts Y<sup>2</sup> of the basic functional groups and contains  
25 an aromatic ring structure,

provided that a unit of -O-O- is not contained in said formulae (1) and (1-1).

2. The ionic liquid type functional material of Claim 1, wherein in said formula (1), -O-R- in -D- has at least one kind of fluoroether unit selected from the group consisting of -(OCFZ<sup>1</sup>CF<sub>2</sub>)-, -(OCF<sub>2</sub>CF<sub>2</sub>CF<sub>2</sub>)-, -(OCH<sub>2</sub>CF<sub>2</sub>CF<sub>2</sub>)-, -(OCFZ<sup>2</sup>)-, -(OCZ<sup>3</sup><sub>2</sub>)-, -(CFZ<sup>1</sup>CF<sub>2</sub>O)-, 5 -(CF<sub>2</sub>CF<sub>2</sub>CF<sub>2</sub>O)-, -(CH<sub>2</sub>CF<sub>2</sub>CF<sub>2</sub>O)-, -(CFZ<sup>2</sup>O)- and -(CZ<sup>3</sup><sub>2</sub>O)-, wherein Z<sup>1</sup> and Z<sup>2</sup> are the same or different and each is H, F or CF<sub>3</sub>; Z<sup>3</sup> is CF<sub>3</sub>.

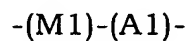
3. The ionic liquid type functional material of Claim 1 or 2, wherein Ra is selected from fluorine-containing alkyl groups Rx having 10 1 to 20 carbon atoms.

4. The ionic liquid type functional material of Claim 1 or 2, wherein Ra is a monovalent organic group Ry' having 2 to 20 carbon atoms which has at least one selected from the basic functional groups 15 Y<sup>1</sup> and/or the salts Y<sup>2</sup> of the basic functional groups and contains an aromatic ring structure.

5. The ionic liquid type functional material of any of Claims 1 to 3, wherein the basic functional group or the salt of the basic 20 functional group contained in said Ry is at least one kind selected from amines, imines, enamines, ketimines, azines and salts thereof.

6. An ionic liquid type functional material comprising a fluorine-containing polymer represented by the formula (M-1):

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wherein the structural unit M1 is at least one selected from structural units derived from ethylenic monomers having, in a side chain thereof, a moiety represented by the formula (2):



in which  $-D^1-$  is a fluoroether unit represented by the formula (2-1):



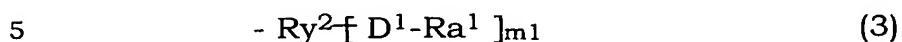
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wherein  $R^1$  is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of hydrogen atoms is replaced by fluorine atom;  $n1$  is an integer of from 1 to 20;  $Ry^1$  is a monovalent organic group having 2 to 30 carbon atoms  
 15 which has at least one selected from basic functional groups  $Y^1$  and/or salts  $Y^2$  of the basic functional groups and contains an aromatic ring structure, provided that a unit of  $-O-O-$  is not contained in the structural unit M1 and the formula (2-1); the structural unit A1 is a structural unit derived from a monomer being copolymerizable with the  
 20 monomer being capable of providing the structural unit M1, and the structural units M1 and A1 are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

7. An ionic liquid type functional material comprising a  
 25 fluorine-containing polymer represented by the formula (M-2):



wherein the structural unit M2 is a structural unit derived from an ethylenic monomer having, in its side chain, a moiety represented by the formula (3):



in which  $Ry^2$  is a di-, tri- or tetra-valent organic group having 2 to 30 carbon atoms which has at least one of basic functional groups  $Y^1$  and/or salts  $Y^2$  of the basic functional groups and contains an aromatic ring structure;  $Ra^1$  is a monovalent organic group which has 1 to 20 carbon atoms and does not contain  $D^1$ , and when  $m1$  is not less than 2, two or more of  $Ra^1$  may be the same or different;  $m1$  is an integer of from 1 to 3;  $-D^1-$  is selected from the same units as defined in the formula (2) of Claim 6, and when  $m1$  is not less than 2, two or more of  $D^1$  may be the same or different, provided that a unit of  $-O-O-$  is not contained in the structural unit  $M2$  and the formulae (2-1); the structural unit  $A2$  is a structural unit derived from a monomer being copolymerizable with the monomer being capable of providing the structural unit  $M2$ , and the structural units  $M2$  and  $A2$  are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

8. The ionic liquid type functional material of Claim 7,  
wherein Ra<sup>1</sup> is selected from fluorine-containing alkyl groups Rx<sup>1</sup>  
25 having 1 to 20 carbon atoms.

9. The ionic liquid type functional material of any of Claims

6 to 8, wherein the basic functional group  $Y^1$  or the salt  $Y^2$  of the basic functional group contained in said  $Ry^1$  and  $Ry^2$  is at least one kind selected from amines, imines, enamines, ketimines, azines and salts thereof.

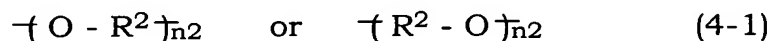
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10. An aromatic compound which has a fluorine-containing ether chain and is represented by the formula (4):



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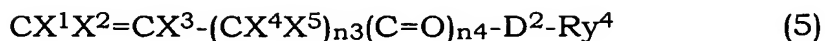
wherein  $-D^2-$  is a fluoroether unit represented by the formula (4-1):



15 in which  $R^2$  is at least one selected from divalent fluorine-containing alkylene groups having 1 to 5 carbon atoms in which at least one of hydrogen atoms is replaced by fluorine atom;  $n2$  is an integer of from 1 to 20, and when  $m2$  is not less than 2, two or more of  $D^2$  may be the same or different;  $Ry^3$  is a mono-, di-, tri- or tetra-valent organic group  
20 having 2 to 30 carbon atoms which has at least one of amines and/or salts of amines and contains an aromatic ring structure;  $Rx^2$  is a fluorine-containing alkyl group having 1 to 20 carbon atoms, and when  $m2$  is not less than 2, two or more of  $Rx^2$  may be the same or different;  $m2$  is an integer of from 1 to 4, provided that a unit of  $-O-O-$  is not  
25 contained in said formulae (4) and (4-1).

11. An aromatic compound which has a fluorine-containing

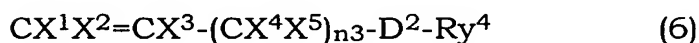
ether chain and is represented by the formula (5):



5 wherein  $X^1$ ,  $X^2$ ,  $X^4$  and  $X^5$  are the same or different and each is hydrogen atom or fluorine atom;  $X^3$  is selected from hydrogen atom, fluorine atom,  $CH_3$  and  $CF_3$ ;  $n_3$  and  $n_4$  are the same or different and each is 0 or 1;  $Ry^4$  is a monovalent organic group having 2 to 30 carbon atoms which has at least one of amines and/or salts of amines  
10 and contains an aromatic ring structure;  $D^2$  is as defined in the formula (4) of Claim 10.

12. The aromatic compound of Claim 11 which has a fluorine-containing ether chain and is represented by the formula (6):

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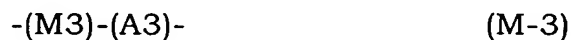


wherein  $X^1$ ,  $X^2$ ,  $X^3$ ,  $X^4$ ,  $X^5$ ,  $n_3$ ,  $D^2$  and  $Ry^4$  are as defined in said formula (5).

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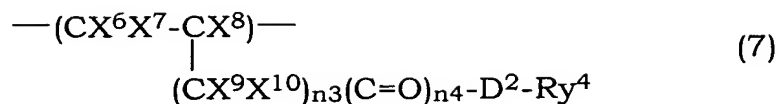
13. A fluorine-containing polymer which has a number average molecular weight of from 500 to 1,000,000 and is represented by the formula (M-3):

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wherein the structural unit M3 is a structural unit represented by the

formula (7):

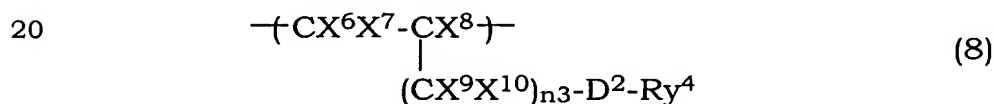


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wherein X<sup>6</sup>, X<sup>7</sup>, X<sup>9</sup> and X<sup>10</sup> are the same or different and each is hydrogen atom or fluorine atom; X<sup>8</sup> is selected from hydrogen atom, fluorine atom, CH<sub>3</sub> and CF<sub>3</sub>; n<sub>3</sub> and n<sub>4</sub> are the same or different and each is 0 or 1; D<sup>2</sup> and Ry<sup>4</sup> are as defined in the formula (5) of Claim 11; the structural unit A3 is a structural unit derived from a monomer being copolymerizable with the monomer being capable of providing the structural unit M3, and the structural units M3 and A3 are contained in amounts of from 1 to 100 % by mole and from 0 to 99 % by mole, respectively.

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14. The fluorine-containing polymer of Claim 13, wherein the structural unit M3 is a structural unit represented by the formula (8):



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wherein X<sup>6</sup>, X<sup>7</sup>, X<sup>8</sup>, X<sup>9</sup>, X<sup>10</sup>, n<sub>3</sub>, D<sup>2</sup> and Ry<sup>4</sup> are as defined in the formula (7).